

WHAT IS CLAIMED IS:

1. A magnetic memory comprising:

first and second wirings intersecting each other  
and positioned apart from each other;

5 a magnetoresistance effect film positioned between  
the first and second wirings and comprising

a magnetic recording layer configured to  
reverse a magnetization direction thereof by changing a  
direction of a magnetic field, which is generated by  
10 passing writing currents through the first and second  
wirings, between a first direction and a second  
direction different from the first direction,

a magnetization pinned layer configured to  
hold the magnetization direction thereof when the  
15 direction of the magnetic field is changed between the  
first direction and the second direction, and

a nonmagnetic layer intervening between the  
magnetic recording layer and the magnetization pinned  
layer; and

20 a first magnetic film comprising

a first portion facing the magnetoresistance  
effect film with the first wiring interposed  
therebetween and

a pair of second portions positioned on both  
25 sides of the first wiring and magnetically connected to  
the first portion, each of the first and second  
portions comprising either one of a high saturation

magnetization soft magnetic material containing cobalt and a metal-nonmetal nano-granular film.

2. The memory according to claim 1, further comprising a second magnetic film which comprises

5 a third portion facing the magnetoresistance effect film with the second wiring interposed therebetween and

a pair of fourth portions positioned on both sides of the second wiring and magnetically connected to the third portion, each of the third and fourth portions comprising either one of a high saturation magnetization soft magnetic material containing cobalt and a metal-nonmetal nano-granular film.

15 3. The memory according to claim 1, wherein the magnetic recording layer is positioned between the second portions.

4. The memory according to claim 1, wherein a length of the first magnetic film along a longitudinal direction of the first wiring is 1.2 times or more a length of the magnetoresistance effect film along the longitudinal direction of the first wiring.

25 5. The memory according to claim 1, wherein the first magnetic film comprises a high permeable magnetic material as the high saturation magnetization soft magnetic material, the high permeable magnetic material is an alloy containing cobalt or cobalt-iron as a main component, and the first and second wirings contain one

material selected from the group consisting of copper, tungsten, and an alloy of copper and tungsten.

5       6. The memory according to claim 1, wherein the first magnetic film comprises a high permeable magnetic material or cobalt-iron as the high saturation magnetization soft magnetic material, the high permeable magnetic material is an alloy containing cobalt or cobalt-iron as a main component, and each of the first and second wirings has a multilayered structure including a nonmagnetic layer and a high saturation magnetization soft magnetic material layer.

10       7. The memory according to claim 1, wherein the first magnetic film comprises at least one film selected from the group consisting of a Co-Fe alloy film, a Co-Fe-Ni alloy film, a Co-(Zr, Hf, Nb, Ta, Ti) film, an amorphous film of these films, and a metal-nonmetal nano-granular film.

20       8. The memory according to claim 1, wherein the nonmagnetic layer is a nonmagnetic tunnel layer.

20       9. The memory according to claim 1, further comprising a sense current control element configured to control a sense current to be passed through the magnetic memory.

25       10. A magnetic memory comprising:  
first and second wirings intersecting each other and positioned apart from each other;  
a magnetoresistance effect film positioned between

the first and second wirings and comprising

a magnetic recording layer configured to reverse a magnetization direction thereof by changing a direction of a magnetic field, which is generated by passing writing currents through the first and second wirings, between a first direction and a second direction different from the first direction,

first and second magnetization pinned layers sandwiching the magnetic recording layer and each configured to hold a magnetization direction thereof when the direction of the magnetic field is changed between the first direction and the second direction,

a first nonmagnetic layer intervening between the first magnetization pinned layer and the magnetic recording layer, and

a second nonmagnetic layer intervening between the second magnetization pinned layer and the magnetic recording layer; and

a first magnetic film comprising

a first portion facing the magnetoresistance effect film with the first wiring interposed therebetween and

a pair of second portions positioned on both sides of the first wiring and magnetically connected to the first portion, each of the first and second portions comprising either one of a high saturation magnetization soft magnetic material containing cobalt

and a metal-nonmetal nano-granular film.

11. The memory according to claim 10, wherein the second portions are in contact with one of the first and second nonmagnetic layers which is closer to the first magnetic film than the other of the first and second nonmagnetic layers.

12. The memory according to claim 10, further comprising a second magnetic film which comprises a third portion facing the magnetoresistance effect film with the second wiring interposed therebetween and

a pair of fourth portions positioned on both sides of the second wiring and magnetically connected to the third portion, each of the third and fourth portions comprising either one of a high saturation magnetization soft magnetic material containing cobalt and a metal-nonmetal nano-granular film.

13. The memory according to claim 10, wherein the magnetic recording layer is positioned between the second portions.

14. The memory according to claim 10, wherein a length of the first magnetic film along a longitudinal direction of the first wiring is 1.2 times or more a length of the magnetoresistance effect film along the longitudinal direction of the first wiring.

15. The memory according to claim 10, wherein the first magnetic film comprises a high permeable magnetic

material as the high saturation magnetization soft  
magnetic material, the high permeable magnetic material  
is an alloy containing cobalt or cobalt-iron as a main  
component, and the first and second wirings contain one  
5 material selected from the group consisting of copper,  
tungsten, and an alloy of copper and tungsten.

16. The memory according to claim 10, wherein the  
first magnetic film comprises a high permeable magnetic  
material or cobalt-iron as the high saturation  
10 magnetization soft magnetic material, the high  
permeable magnetic material containing cobalt or  
cobalt-iron as a main component, and each of the first  
and second wirings has a multilayered structure  
including a nonmagnetic layer and a high saturation  
15 magnetization soft magnetic material layer.

17. The memory according to claim 10, wherein the  
first magnetic film comprises at least one film  
selected from the group consisting of a Co-Fe alloy  
film, a Co-Fe-Ni alloy film, a Co-(Zr, Hf, Nb, Ta, Ti)  
20 film, an amorphous film of these films, and a metal-  
nonmetal nano-granular film.

18. The memory according to claim 10, wherein the  
nonmagnetic layer is a nonmagnetic tunnel layer.

19. The memory according to claim 10, further  
25 comprising a sense current control element configured  
to control a sense current to be passed through the  
magnetic memory.

20. A magnetic memory comprising:

first and second wirings intersecting each other  
and positioned apart from each other;

a magnetoresistance effect film positioned between  
5 the first and second wirings and comprising

a magnetic recording layer configured to  
reverse a magnetization direction thereof by changing a  
direction of a magnetic field, which is generated by  
passing writing currents through the first and second  
10 wirings, between a first direction and a second  
direction different from the first direction,

first and second magnetization pinned layers  
sandwiching the magnetic recording layer and each  
configured to hold a magnetization direction thereof  
15 when the direction of the magnetic field is changed  
between the first direction and the second direction,

a first nonmagnetic layer intervening between  
the first magnetization pinned layer and the magnetic  
recording layer, and

20 a second nonmagnetic layer intervening  
between the second magnetization pinned layer and the  
magnetic recording layer; and

a first magnetic film comprising

a first portion facing the magnetoresistance  
25 effect film with the first wiring interposed  
therebetween and

a pair of second portions positioned on both

sides of the first wiring and magnetically connected to the first portion, the second portions being in contact with one of the first and second nonmagnetic layers which is closer to the first magnetic film than the other of the first and second nonmagnetic layers.

21. A magnetic memory comprising:

first and second wirings intersecting each other and positioned apart from each other;

a magnetoresistance effect film positioned between the first and second wirings and comprising

a magnetic recording layer configured to reverse a magnetization direction thereof by changing a direction of a magnetic field, which is generated by passing writing currents through the first and second wirings, between a first direction and a second direction different from the first direction,

first and second magnetization pinned layers sandwiching the magnetic recording layer and each configured to hold a magnetization direction thereof when the direction of the magnetic field is changed between the first direction and the second direction,

a first nonmagnetic layer intervening between the first magnetization pinned layer and the magnetic recording layer, and

a second nonmagnetic layer intervening between the second magnetization pinned layer and the magnetic recording layer; and



a first magnetic film comprising

a first portion facing the magnetoresistance effect film with the first wiring interposed therebetween and

- 5 a pair of second portions positioned on both sides of the first wiring and magnetically connected to the first portion, the magnetic recording layer being positioned between the second portions.